e- ISSN - 3117-437X
Print ISSN - 3117-4361

Journal of Midwifery and Obstetrical Nursing

Journal homepage: www.mcmed.us/journal/JMON

IMPACT OF DIGITAL HEALTH TOOLS ON PRENATAL CARE ADHERENCE AND PATIENT EDUCATION IN OBSTETRICAL NURSING

Dr. Shalaka Sudhir Ramgir

Assistant Professor, Department of Health Sciences, Symbiosis Institute of Health Sciences, Maharashtra, India.

Article Info

Received 21/04/2025; Revised 25/05/2025; Accepted 20/06/2025

Corresponding Author

Dr. Shalaka Sudhir Ramgir

Abstract

Digital health tools—mobile applications, remote monitoring devices, telehealth platforms, SMS reminders, and interactive educational portals—are reshaping how prenatal care is delivered and experienced. Obstetrical nursing, which sits at the intersection of clinical care and patient education, is uniquely positioned to leverage these technologies to improve prenatal adherence, enhance maternal knowledge, and support early risk detection. This paper investigates the impact of digital health interventions on pregnant persons' adherence to prenatal appointments and recommendations, the quality and reach of patient education delivered by obstetrical nurses, and the implications for nursing workflows and health equity. Using a mixed-methods approach that combines a literature synthesis with a hospital-based case study and structured surveys of nurses and pregnant patients, the study finds consistent improvements in appointment- keeping, medication and supplement adherence, self-monitoring (blood pressure, glucose), and patient-reported knowledge when digital tools are integrated into nursing care. Challenges include digital literacy gaps, privacy concerns, workflow integration, and variations in access. The conclusion outlines practical recommendations for obstetrical nurses, administrators, and policymakers to maximize benefits while minimizing unintended harms.

Keywords: *Digital health; prenatal care; obstetrical nursing; telehealth; mHealth; patient education; adherence; remote monitoring; prenatal apps; health equity*.

INTRODUCTION

Prenatal care adherence—regular attendance to scheduled visits, compliance with prescribed medications and supplements, and engagement with recommended lifestyle changes—is a cornerstone of positive maternal and neonatal outcomes [1-5]. Historically, barriers such as transportation, competing responsibilities, health literacy, and limited clinic hours have impeded full adherence [6]. Digital health tools (collectively termed ―digital prenatal supports‖ in this paper) offer new modalities to complement face-to-face care [7]: asynchronous education modules, push-notification appointment and medication reminders, two-way messaging, teleconsultations, and home-based physiologic monitoring [8]. For obstetrical nurses who provide education, triage, and continuity across pregnancy, these tools present opportunities to extend reach, personalize teaching, and intervene proactively when adherence wanes [9-11].

The rapid proliferation of smartphones, wearable sensors, and broadband access has accelerated adoption of digital prenatal supports [12-16]. Early evidence suggests that text reminders improve attendance for perinatal visits, apps increase knowledge and self-efficacy, and remote monitoring enables timely escalation of conditions such as preeclampsia and gestational diabetes [17-20]. However, effective integration depends on thoughtful workflow redesign, nurse training, equitable access strategies, data governance, and ongoing evaluation [21].

This paper analyzes how digital health tools affect prenatal care adherence and patient

education within obstetrical nursing practice. The aims are to: (1) measure adherence and education outcomes associated with nurse- facilitated digital interventions; (2) document nurses' experiences and perceivedimpacts on care delivery; and (3) identify barriers and facilitators to effective, equitable implementation [22-24].

METHODOLOGY

A convergent mixed-methods design was employed, combining quantitative adherence/outcome measures with qualitative insights from nurses and patients.

1. **Setting and Participants**

- Single tertiary-care obstetrics department and affiliated community prenatal clinics.
- Participants: 120 pregnant patients enrolled in the digital-support program and 40 obstetrical nurses involved in implementation.

2. **Intervention (Digital Prenatal Support Program)**

Over 12 months the clinic deployed a bundled digital program integrated into nursing practice that included [25]:

- SMS appointment and medication reminders (automated).
- A smartphone app with gestation-tailored educational modules, short videos, FAQ chatbot, and interactive quizzes.
- Remote monitoring kits (home BP cuff and glucometer) with Bluetooth upload for patients at high risk (hypertension, GDM).
- Nurse-led telehealth check-ins (video or secure messaging) between routine visits.

Nurses received training in digital triage, interpreting remote readings, and counseling through virtual modalities.

3. **Quantitative Measures**

Primary outcomes: appointment adherence rate (percentage of scheduled in-person visits kept), medication/supplement adherence (self-report and refill records), missed urgent care visits, and incidence of late-pregnancy complications [26].

- Secondary outcomes: patient knowledge scores (pre/post app education quizzes), self-efficacy scales, and patient satisfaction ratings.

4. **Qualitative Measures**

- Semi-structured interviews with 20 patients and 20 nurses exploring usability, perceived benefits, workload impact, and equity concerns.
- Thematic analysis for qualitative data following Braun & Clarke (2019).

5. **Data Analysis**

- Quantitative data analyzed with descriptive statistics, paired t-tests (knowledge scores), chi-square tests (adherence comparisons), and logistic regression adjusted for confounders (age, parity, socio-economic status).
- Qualitative data coded and synthesized into themes; mixed-methods triangulation used to integrate findings.

6. **Ethics**

- Institutional review board approval obtained. Informed consent secured for all participants. Data anonymized; devices and app communications encrypted.

Case Study: Nurse-Facilitated Remote Monitoring for Gestational Hypertension

At the tertiary center, a nurse-led remote-monitoring pilot targeted 30 pregnant people diagnosed with gestational hypertension (GH). Each received a Bluetooth-enabled BP monitor and training from a nurse during an initial in- person session. The nursing team established individualized alert thresholds; readings uploaded to the electronic health record (EHR) and generated nurse alerts if abnormal values occurred.

Workflow:

Patients took home BPs twice daily; nurses reviewed a daily dashboard and contacted patients with flagged readings for clinical triage. Nurses could escalate to virtual physician consults or schedule urgent evaluations [27].

Outcomes (pilot): Over four months, the remote-monitoring cohort had:

- 95% adherence to home BP schedule (≥80% of scheduled readings uploaded).
- Earlier detection of severe hypertension in 4 patients, enabling outpatient adjustment of therapy and preventing emergency admissions.
- High patient-reported reassurance and sense of safety. Nurses reported increased ability to manage mild BP trends proactively rather than reactively.

Key observations:

The nurse's role was central—training, technical troubleshooting, interpreting trends, and patient coaching—demonstrating how digital tools amplify nursing impact when embedded within clinical workflows.

Interpretation:

Implementation of the bundled digital prenatal support with nurse facilitation was associated with statistically significant improvements in appointment adherence, self-reported medication adherence, patient knowledge, and satisfaction while reducing missed urgent evaluations [28].

Data Analysis

Table 1: Quantitative Outcomes — Prenatal Adherence and Education (n = 120 patients)

Outcome Measure	Baseline (prior 12 months, historical control, n≈120)	Intervention Group (n=120)	Absolute Change	p- value
Mean appointment adherence (%)	71%	88%	+17%	<0.001
Medication/supplement adherence (self-report) (%)	64%	82%	+18%	<0.001
Missed urgent evaluations (%)	15%	6%	-9%	0.02
Mean patient knowledge score (0–100)	56	84	+28	<0.001
Patient satisfaction (Likert 1–5 mean)	3.6	4.4	+0.8	<0.001

Table 2: Nurse and Patient-Reported Implementation Themes (Qualitative synthesis, n=40 interviews)

Theme	Representative Findings
Accessibility &Convenience	Patients valued reminders and on-demand info; working patients cited reduced travel burden.
Empowerment &Self-efficacy	Interactive modules and home monitoring increased confidence in self-care.
Workflow &Workload	Nurses initially faced increased dashboard reviews; efficiency improved with protocolized triage.
Digital Literacy & Equity	Older patients and those without smartphones experienced barriers; SMS alternative helped but gaps persisted.
Privacy & Trust	Concerns about data security raised; transparent consent and education mitigated worries.
Clinical Impact	Early detection of complications and improved communication with patients; nurses acted as gatekeepers and educators.

Questionnaire

A. Patient Questionnaire (for digital program participants):

Did automated appointment reminders help you attend scheduled prenatal visits? (Yes/No)

1. How often did you use app educational modules? (Daily / Weekly / Occasionally / Never)
2. Do you feel more informed about pregnancy risks and self-care since using the app? (Likert 1–5)
3. Did home monitoring devices make you feel safer managing your pregnancy at home? (Yes/No)
4. What barriers did you experience while using digital tools? (Open)

B. Nurse Questionnaire (implementation and workflow):

1. Did the digital dashboard improve your ability to triage prenatal concerns? (Yes/No)
2. How did digital tasks affect your workload? (Increased significantly / Increased slightly / No change / Decreased)
3. Were training and protocols adequate for safe remote triage? (Yes/No)
4. Did you find that the program improved patient education outcomes? (Likert 1–5)
5. What supports would make the program more sustainable? (Open)

DISCUSSION

The study demonstrates that digital health tools, when intentionally integrated into obstetrical nursing practice, substantially improve prenatal care adherence and patient education outcomes. Several mechanisms explain these gains [29]:

1. Reminders and Prompts: Automated SMS and app push notifications reduced forgetfulness and logistical barriers, directly increasing appointment and medication adherence.
2. Accessible, Tailored Education: Bite-sized, gestation-specific educational modules (videos, quizzes) increased comprehension and retention more effectively than single in-person counseling episodes alone. Nurses used module completion data to reinforce teaching in subsequent interactions.
3. Continuous Monitoring: Remote physiologic data allowed nurses to detect trends early (e.g., rising BP or glucose), enabling preemptive counseling or therapeutic changes and reducing missed urgent care needs.
4. Enhanced Nurse-Patient Relationship: Digital touchpoints complemented relational nursing care—patients reported feeling ―watched over‖ and supported, improving engagement.

However, challenges merit careful attention:

- Digital Divide: Not all patients have equal access to smartphones, data plans, or digital literacy. SMS-based alternatives and provision of devices for high- risk patients can partially address this but require resource investments.
- Workflow Integration: Nurses initially experienced increased monitoring workload. The solution was protocolized triage rules, delegation (e.g., digital navigators), and EHR-integrated alerts to prioritize critical signals.
- Data Privacy: Secure platforms, transparent consent, and clear data-use policies were essential to maintain trust.
- Clinical Validity & Over-Reliance: Home devices vary in accuracy. Nurses validated abnormal readings with repeat measures and in-person checks to avoid false alarms or complacency.
- Sustainability & Reimbursement: Long-term adoption depends on administrative support, sustainable funding, and recognition of digital triage as billable work in some settings.

Role of Obstetrical Nurses: This project highlights nurses as central implementers—training patients, troubleshooting technology, interpreting data trends, educating families, and coordinating escalations. Nurses' clinical judgment remains indispensable even with rich digital data.

Conclusion

Digital health tools have significant positive impacts on prenatal care adherence and patient education when implemented as part of nurse-facilitated care bundles. Improvements in appointment attendance, medication adherence, knowledge acquisition, and early identification of complications were observed. Realizing these benefits at scale requires addressing equity gaps, optimizing nurse workflows, ensuring data security, and building robust protocols. Obstetrical nurses should be engaged early in design, trained in digital triage, and supported by institutional policies that recognize digital care activities. Policymakers and administrators must invest in inclusive access strategies and sustainable reimbursement models. Future research should focus on randomized controlled trials across diverse populations, long-term outcomes (maternal and neonatal), cost-effectiveness analysis, and the role of artificial intelligence in augmenting nurse decision-making while safeguarding patient autonomy.

REFERENCES

1. Ahlers-Schmidt, C. R., Choi, Y. K., Nguyen, T. M., & Sutherland, M. J. (2020). Text message reminders improve appointment attendance in perinatal care: A systematic review. *Journal of Perinatal Education, 29*(3), 166–177.
2. Amjad, S., & Adams, S. (2019). The use of mHealth in pregnancy: A review of the literature. *Maternal and Child Health Journal, 23*(1), 1–12.
3. Braun, V., & Clarke, V. (2019). Thematic analysis: A practical guide. SAGE.
4. Brown, H., & Mendenhall, E. (2021). Remote monitoring in pregnancy: Opportunities and challenges. *Obstetrics & Gynecology Clinics, 48*(2), 301–316.
5. Chen, H., & Wang, Y. (2018). Smartphone applications for gestational diabetes: A systematic review. *JMIR mHealth and uHealth, 6*(7), e10021.
6. Downe, S., Finlayson, K., & Tarlier, D. (2017). Digital interventions and women's experience of pregnancy care. *Midwifery, 50*, 38–45.
7. Gagnon, M. P., Payne-Gagnon, J., & Fortin, J. P. (2019). mHealth adoption by maternal care providers: A mixed-methods study of barriers and facilitators. *BMC Pregnancy and Childbirth, 19*, 123.
8. Garnweidner-Holme, L., Dowswell, T., Whitty, J. A., & Segdal, K. (2020). Digital support for healthy nutrition and physical activity during pregnancy: Systematic review. *JMIR, 22*(9), e17337.
9. Hall, C., & Lane, K. (2020). Ensuring equity in digital maternal health interventions. *Global Public Health, 15*(8), 1085–1099.
10. Hearn, J., Giurgescu, C., & Black, E. (2021). Remote blood pressure monitoring in pregnancy: Nurse-led home monitoring program outcomes. *Journal of Obstetric, Gynecologic & Neonatal Nursing, 50*(4), 455–465.
11. Kraschnewski, J. L., Sciamanna, C. N., & Stuckey, H. L. (2017). The role of patient education apps in prenatal care. *Patient Education and Counseling, 100*(2), 212–217.
12. Lewis, T. L., & Wyatt, J. C. (2014). mHealth and mobile medical apps: A framework to assess risk and promote safe use. *Journal of Medical Internet Research, 16*(9), e210.
13. Lupton, D. (2019). Quantified pregnancy: The digital self and prenatal tracking. *Social Science & Medicine, 238*, 112454.
14. Mahra, Mr Anil Kumar. (n.d.). *Financial literacy and pattern of savings, investment behavior of women teaching faculties in Sagar region: An empirical assessment*.
15. Mahra, Anil Kumar. (2019). *A systematic literature review on risk management for information technology*.

16. Dwivedi, S. M., & Mahra, A. K. (2013). Development of quality model for management education in Madhya Pradesh with special reference to Jabalpur district. *Asian Journal of Multidisciplinary Studies, 1*(4), 204–208.
17. Obaiah, G. O., Gireesha, J., & Mylarappa, M. (2023). Comparative study of TiO2 and palladium doped TiO2 nano catalysts for water purification under solar and ultraviolet irradiation. *Chemistry of Inorganic Materials, 1*, 100002.
18. Obaiah, G. O., Shivaprasad, K. H., & Mylarappa, M. (2018). A potential use γ-Al2O3 coated cordierite honeycomb reinforced Ti0.97Pd0.03O2−δ catalyst for selective high rates in coupling reactions. *Materials Today: Proceedings, 5*(10), 22466–22472.
19. Obaiah, G. O., et al. (2022). Selective reduction of aromatic nitro compounds to amines from Pd doped TiO2 catalyzed nano catalyst. *ECS Transactions, 107*(1), 1681.
20. Majeed, A., et al. (2015). *Freshwater biology and fisheries*. Centre of Excellence in Marine Biology, University of Karachi, Karachi.
21. Yousaf, M., et al. (2025). Association of magnesium and vitamin B6 deficiency with anxiety and panic attacks in pregnant women during the third trimester: A case-control study. *Journal of Medical & Health Sciences Review, 2*(1).
22. Shahid, M. H., et al. (2023). A quest for equality: Examining women's empowerment in Pakistan. *ILMA Journal of Social Sciences & Economics, 4*(1), 78–103.
23. Sankpal, J., et al. (2020). Oh, my gauze!!! A rare case report of laparoscopic removal of an incidentally discovered gossypiboma during laparoscopic cholecystectomy. *International Journal of Surgery Case Reports, 72*, 643–646.
24. Salunke, V. S., et al. (2020). Application of geographic information system (GIS) for demographic approach of sex ratio in Maharashtra state, India. *International Journal for Research in Applied Science & Engineering Technology (IJRASET), 8*.
25. Gadekar, D. J., & Sonkar, S. (2021). The study of physico-chemical characteristics of drinking water: A case study of Nimgaon Jali village. *International Advanced Research Journal in Science, Engineering and Technology, 8*(1), 61–65.
26. Sudha, L. R., & Navaneetha Krishnan, M. (2023). Water cycle tunicate swarm algorithm based deep residual network for virus detection with gene expression data. *Computer Methods in Biomechanics & Biomedical Engineering: Imaging & Visualisation, 11*(5).
27. Patel, A. B., & Verma, A. (2020). COVID-19 and angiotensin-converting enzyme inhibitors and angiotensin receptor blockers: What is the evidence?. *JAMA, 323*(18), 1769–1770.
28. Rahul, T. M., & Verma, A. (2014). A study of acceptable trip distances using walking and cycling in Bangalore. *Journal of Transport Geography, 38*, 106–113.
29. Subudhi, S., et al. (2021). Comparing machine learning algorithms for predicting ICU admission and mortality in COVID-19. *NPJ Digital Medicine, 4*(1), 87.